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X

NOTES ON WEST AMERICAN CHITONS—I.*

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1. NOTES ON CHITONS COLLECTED BY MR. GEORGE WILLETT IN SOUTHEASTERN ALASKA

In the present paper are given the preliminary results of the examination of a considerable series of chitons collected by Mr. George Willett in southeastern Alaska during the summers of 1913 to 1916, inclusive. Although chiefly occupied with other business, his personal interest in the group caused Mr. Willett to devote odd moments to the collection of mollusks, both on shore and, by means of a small dredging outfit, in depths down to 50 or more fathoms. The Polyplacophora comprise an important part of the spoils obtained, both individuals and species being extensively represented. Mr. Willett has generously placed at my disposal for investigation the entire series of over 600 specimens, along with certain verbal field observations of sufficient ecological interest that I have quoted from them freely. A small portion of the material was fortunately preserved in alcohol and has proved invaluable, though not all the species taken are represented in this way and several interesting problems must therefore go over until further material can be obtained.

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As indicative of what careful and exhaustive collecting will accomplish for such a group as the chitons, even in a restricted locality, I may mention that Mr. Willett's first invoice of specimens sent me from his 1914 collection included thirteen species. The number has since been increased to the present total of twenty-four species and one subspecies, yet I am certain that this figure is by no means complete for the region involved, and perhaps not even exhaustive for the collections as they stand.

While the bulk of Mr. Willett's collecting was done at Forrester Island, a small oceanic island at the extreme southern end of the territorial jurisdiction, he also did some work at the Waterfall Cannery on Prince of Wales Island, just inside Cape Lookout on Dall Island, and at Sitka, all these last localities being on the western or oceanic coasts of the island chain, though protected from the open ocean itself, so that the water is relatively calm.

He reports that *Tonicella lineata* is everywhere by far the most abundant shore chiton. This and *Katharina* (also abundant) occur on rocks between tides, whereas *Ischnochiton mertensii* (common), *I. trifidus* (rare), *Schizoplax,* and *Leptochiton,* characteristically occur on the under sides of rocks "at pretty low tides (—1.0 foot)." *Cyanoplax* is another characteristic shore form, being fond of crevices. In shallow depths (15 to 25 fathoms), just beyond the kelp line, and found mostly adhering to the inside of old mussel shells, occurs an interesting association: *Leptochiton cancellatus, Tonicella lineata,* juv. (common), *T. ruber, T. submarmorea* (rather rare), *Ischnochiton interstinctus* (abundant), *I. retiporosus, I. trifidus* (rare), *I. mertensii* (abundant), *I. willetti* (common), *Trachydermon flectens* (rather rare), *Mopalia ciliata, M. imporcata,* and *M. sinuata.* These occasionally occur also on rocks hauled up in the dredge, but Mr. Willett states that the shells are a favorite situs. *Placiphorella rufa,* on the other hand, is found occasionally on shells, but generally on rocks. In deeper water (40 to 50 fathoms) *Ischnochiton retiporosus* was the only form commonly obtained.

In the present paper two species, *Ischnochiton* (*Lepidozona*) *willetti* and *Placiphorella rufa,* are described as new.

Where possible a series of duplicates, including paratypes of the new species, has been deposited in the collection of the California Academy of Sciences.

Mr. Willett has also generously permitted my personal retention of a considerable series of specimens, further data from which are accumulating and will be offered on a subsequent occasion.

Below is given a systematic list of all the species so far identified. Following the list are given notes on the various forms with a memorandum of the localities at which they were obtained, and such ecologic data as are now possible.

Systematic List of Species.

No. of Specimens

Family Lepidopleuridæ

Genus *Leptochiton* Gray, 1847.

1.) *L. cancellatus* (Sowerby, 1839) 13
2.) *L.* sp. near *rugatus* ("Carpenter," Pilsbry, 1892) 35

Family Callochitonidæ.

Genus *Tonicella* Carpenter, 1873.

3.) *T. ruber* (Linnæus, 1767) 15
4.) *T. lineata* (Wood, 1815) 65
5.) *T. submarmorea* (Middendorff, 1846) 21

Genus *Cyanoplax* (Pilsbry, 1892)

6.) *C. raymondi* (Pilsbry, 1894) 12

Genus *Schizoplax* Dall, 1878.

7.) *S. brandtii* (Middendorff, 1846) 66

Family Ischnochitonidæ.

Genus *Ischnochiton* Gray, 1847.

8.) *I. interstinctus* (Gould, 1852) 135
9.) *I. radians* Carpenter, 1892 8
10.) *I.* (*Lepidozona*) *retiporosus* Carpenter, 1864.. 36

		No. of Specimens
11.)	*I.* (*Lepidozona*) *mertensii* (Middendorff, 1846)	59
12.)	*I.* (*Lepidozona*) *willetti,* new species	36
13.)	*I.* (*Ischnoradsia*) *trifidus* (Carpenter, 1864)	6

Family Mopaliidæ.

Genus *Trachydermon* Carpenter, 1864.

14.)	*T. flectens* (Carpenter, 1864)	10

Genus *Mopalia* Gray, 1847.

15.)	*M. ciliata* (Sowerby, 1840)	4
16.)	*M. ciliata wosnessenskii* (Middendorff, 1847)	28
17.)	*M. hindsii* (Reeve, 1847)	7
18.)	*M. lignosa* (Gould, 1846)	4
19.)	*M. muscosa* (Gould, 1846)	1
20.)	*M. imporcata* Carpenter, 1864	29
21.)	*M. sinuata* Carpenter, 1864	7

Genus *Placiphorella* Carpenter, 1878.

22.)	*P. velata* "Carpenter," Dall, 1878	2
23.)	*P. rufa,* new species	15

Genus *Katharina* Gray, 1847.

24.)	*K. tunicata* (Wood, 1815)	4

Family Cryptoplacidæ.

Genus *Cryptochiton* (Middendorff, 1847).

25.)	*C. stelleri* (Middendorff, 1847)	4
		622

Notes on the Species.

1. **Leptochiton cancellatus** (Sowerby)

Taken in 20 fathoms at Forrester Island in 1915. This is the smallest chiton in the collection and one of the smallest species we know.

The rehabilitation of Gray's old genus *Leptochiton* may occasion some surprise, but perhaps not to those who have felt with the writer that *Lepidopleurus* Risso, in the sense in which it has been commonly used, is little but an amorphous

mixture. The relatively delicate and smooth-shelled *Lepidopleuridæ* of the west American coast seem only diffidently congeneric with *L. cajetanus* Poli, the thick rugose shell selected by Pilsbry as Risso's type. It may be that further anatomical work will require the dismemberment even of *Leptochiton,* but in the meanwhile it does not seem to strain the relationships seriously to make this genus do duty again.

2. **Leptochiton,** species

Numerous specimens of a worn *Leptochiton,* recalling the southern *L. rugatus,* were taken "at pretty low tides" at the Waterfall Cannery, Prince of Wales Island. One specimen of the same was also taken at Cape Lookout, Dall Island. It occurs under rocks. Whether the specimens are really *rugatus* or some undescribed form must be determined by further study. They differ from southern California (La Jolla) specimens of *rugatus* in their much smaller size, whiter coloration, more pilose girdle and flatter posterior valve, only slightly if at all concave behind the mucro.

3. **Tonicella ruber** (Linnæus)

Taken at Forrester Island in 15-30 fathoms, occurring in association with the small *Tonicella* I have here taken to be young *lineata* (Wood).

Balch (:06, p. 62) has remarked at length upon the apparent close relationship of this species and *Tonicella marmorea. Ruber* had for years been placed by nearly all writers in *Trachydermon,* and to avoid separating the two generically, Balch thereupon removed *marmorea* to *Trachydermon,* leaving the genus *Tonicella* to whatever might be its fate after the loss of its type species. For reasons which will presently be given in another connection, I have come to the conclusion that *Trachydermon* is quite a different group from what has generally been understood, but since both Sykes ('94, p. 36) and Thiele (:10, p. 107) have shown cause for referring *ruber* itself to *Tonicella,* there is a convenient way out of the difficulty.

4. **Tonicella lineata** (Wood)

This species is reported by Willett as by far the most abundant of the shore chitons in all the localities he visited, though all the specimens seen by me were taken at Forrester Island, some on shore, the remainder dredged in from 10 to 30 fathoms.

The shore specimens are stated to be usually found on top of the rocks in association with the very dissimilar *Katharina,* and their beautiful coloring is almost always obscured by a green deposit very difficult to remove. It is interesting to note that all the dredged specimens I have included here run very much smaller than those taken between tides, including not a single specimen larger than 21x12 mm. (gross measurements of a specimen in alcohol [S. S. B. 291]). Willett even writes on one of his labels: "I consider this entirely distinct from the true *lineata.* It is confined to deep water, not occurring in shallow water with latter." However, except for a certain curious uniformity in general facies, I have been unable to find any dependable evidence (among *external* characters alone) confirming this opinion. It may be mentioned also that whereas there are no large specimens among the dredged material, I have on the other hand seen no small ones from the shore.

5. **Tonicella submarmorea** (Middendorff)

Taken in 15 to 25 fathoms at Forrester Island. Willett reports this species as "not common and always dredged." All the specimens are rather small. The prevailing color is usually a beautiful rose red.

6. **Cyanoplax raymondi** (Pilsbry)

Taken at Forrester Island, and at the Waterfall Cannery, Prince of Wales Island, "invariably between tides." This species "likes to get in a crack in the rocks," though it is sometimes found on top.

7. **Schizoplax brandtii** (Middendorff)

Taken at Forrester Island, and at the Waterfall Cannery, Prince of Wales Island. *Schizoplax* was found only on shore, and there "under rocks at pretty low tides."

The largest specimen seen measures as follows:

Maximum length of animal	18	mm.
Maximum width of animal	13.5	mm.
Length of shell alone	17.5	mm.
Width of fourth valve inside girdle	13	mm.

8. **Ischnochiton interstinctus** (Gould)

Dredged in 10 fathoms in Sitka Harbor in 1913, and in 10 to 20 fathoms at Forrester Island in the three subsequent years. This and *I. mertensii* are by far the most abundant of the dredged species. It was not taken between tides.

9. **Ischnochiton radians** Carpenter

Specimens which seem unmistakably to belong to this species were taken on shore at the Waterfall Cannery, Prince of Wales Island, and near Cape Lookout, Dall Island. So far as I have been able to ascertain, they constitute the first Alaskan record for the species. Barkley Sound, B. C., was previously the most northern station recorded.

I. radians and *I. interstinctus* are very closely related and though most lots may be readily separated by their relative size and color, some of the specimens are sufficiently intermediate so that with occasional undissected shells I have had to fall back upon the blue-green interior usually possessed by *radians* and similar trifling features to separate them.

Three of the four specimens taken at Dall Island [S. S. B. 258] are of a peculiar dark color variant which is also found occasionally in the vicinity of Monterey.

10. **Ischnochiton (Lepidozona) retiporosus** Carpenter

Taken at Forrester Island in 15 to 50 fathoms. While dredged occasionally in 15-20 fathoms in association with

I. interstinctus, it is more abundant in the deeper water. One specimen in alcohol [S. S. B. 236] is close to if not identical with the var. *punctatus* Whiteaves.

Thiele (:10, p. 87, 107) transfers this species to *Callistochiton,* but this step I do not yet feel ready to follow.

11. **Ischnochiton (Lepidozona) mertensii** (Middendorff)

Numerous specimens of this species are in the collection taken between tides and dredged (15-20 fathoms) at Forrester Island, and between tides at the Waterfall Cannery, Prince of Wales Island. At Forrester Island Mr. Willett found it one of the two most abundant chitons in his dredge. The specimens are almost all of the plain red-brown variety, the girdle obscurely maculated in two shades of brown. Less common, but equally constant in their peculiarities, are two other color forms, analogous variations of which are also commonly seen in California suites of this species: 1) a form in which the valves are irregularly maculated with various shades of brown, the alternate bands of color on the girdle being usually quite regular and prominent; 2) a form in which the jugal areas of the second and seventh valves are usually darker than the general red-brown ground color, and help to set off a cream-colored band nearly as wide as the valves, which extends down the side slopes and across the girdle, the latter being otherwise nearly unicolored.

12. **Ischnochiton (Lepidozona) willetti,** new species

Numerous specimens occurring at Forrester Island in 15 to 20 fathoms in company with *I. mertensii,* might easily be overlooked as another color variety of the latter, but appear upon careful examination to represent an undescribed species, which may be briefly treated as follows:

Diagnosis: Shell rather large, regularly elliptical (fig. 1); elevated, with an angular dorsal ridge and arcuate side slopes. General surface indistinctly granulose.

Anterior valve with 35-45 low, occasionally bifurcating, radiating ribs, separated by shallow distinct grooves and bearing a variable number (normally 8 to 10) of small, well sep-

arated, distinct, rounded pustules. Median valves: lateral areas distinctly raised, sculptured like the anterior valve, but the 5 to 7 ribs relatively wider and more flattened, the defining

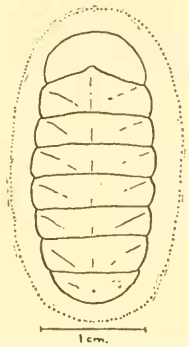

Fig. 1. *Ischnochiton* (*Lepidozona*) *willetti* Berry, camera outline of dorsal aspect of type specimen, x1½.

grooves sometimes, but not always, sharply chiseled (fig. 2); central areas on each side sharply sculptured with 20-25 narrow, faintly beaded, longitudinal ridges, their interstices traversed by low, rather irregular cross-ridges, becoming nearly or quite obsolete at the jugum. Posterior valve with mucro well in front of center; region behind mucro sculptured like the anterior valve, but the 28-30 ribs rather less distinct and the

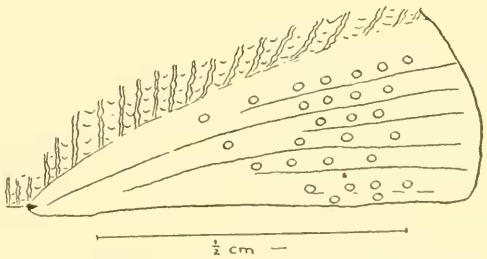

Fig. 2. *Ischnochiton* (*Lepidozona*) *willetti* Berry, sketch of portion of 5th valve of type to indicate the general scheme of sculpturing, x8.

grooves less conspicuous; region in front of mucro sculptured like the central areas of the intermediate valves.

Interior of central valves thickened across the middle. Teeth with a distinct fossa separating them at base from body of

shell, their edges roughened, those of the posterior valve almost crenate. Anterior valve with 11, second valve with 2-1, third to seventh valves with 1-1, posterior valve with 12, slits.

Girdle wide, regular; covered dorsally with a closely imbricating armature of large, smooth or barely striated, convex scales, each normally bearing a short, striated, nipple-shaped process projecting upward from the dorsal end.

Color of outer surface of shell a reddish brown of varying intensity in different specimens, sometimes nearly black; girdle lighter. Interior of shell light salmon.

Maximum length of the type and largest specimen 29.5 mm.; width 16 mm.

Type: A shell preserved dry [S. S. B. 159] as Cat. No. 3700 of the author's collection. Paratypes have been deposited in the collections of the California Academy of Sciences, the Academy of Natural Sciences of Philadelphia, the United States National Museum, and the private collection of Mr. George Willett.

Type Locality: 15-20 fathoms, Forrester Island, Alaska; George Willett, May-July-August, 1914-1916; 36 specimens.

Remarks: As above noted, this species has a close superficial resemblance to its associate and congener, *I. mertensii.* It is easily recognized, however, by its narrower outline when viewed vertically, the grooves chiseled between the ribs of the terminal and lateral areas, its finer sculpture, and generally characteristic darker red-brown coloration. A nearer relative is possibly a species now being described as *I. interfossa* Berry, from northern Japan, but the more arcuate side slopes, the less pitted sculpturing of the central areas, and again the color, furnish easy distinguishing marks.

13. **Ischnochiton (Ischnoradsia) trifidus** (Carpenter)

One specimen of this interesting species was taken at a very low tide near the Waterfall Cannery, Prince of Wales Island. Five others were dredged in 15-20 fathoms at Forrester Island in company with *I. mertensii.* Mr. Willett believes it to be a rather rare species.

14. **Trachydermon flectens** (Carpenter)

One specimen of this species was taken at low tide inside Cape Lookout, Dall Island. Others were dredged at Forrester Island in 15-30 fathoms.

My reasons for the unusual position in which I have placed *Trachydermon* in the list will be given in the next note of this series.

15. **Mopalia ciliata** (Sowerby)

Four specimens more or less referable to typical *ciliata* as redefined by Pilsbry were taken in 15 fathoms at Forrester Island [S. S. B. 278].

The last word has not been said on the West American Mopaliæ, and I have no hope that my treatment of them here, merely adapted as it is from work done a considerable period ago, can be more than provisional. This remark is not to be construed as an attempt to carp at the older work. That of Pilsbry in particular constituted a tremendous advance in our understanding of the entire group and stands alone not only as a reference work, but as a priceless text and source of inspiration to every subsequent student of Polyplacophora. But dried specimens, upon which most taxonomic work in this group has perforce been done, are often extremely deceptive, and this is notoriously the case with the Mopalias. In this instance it is going to require a far more extensive array of well-preserved alcoholic material than exists at present, I fear, in all our collections, to definitely settle the status of the numerous named forms, let alone the many others which still remain to be described. No doubt Dall and Pilsbry have generally been quite correct in reducing many of the earlier species to synonymy, but I feel certain that in some cases the process has been carried too far.

Some of Mr. Willett's small Mopalias form a curious assemblage, but the series is not sufficiently complete and the proportion of specimens preserved in alcohol too scanty to permit the drawing of satisfactory conclusions from them at the present time, though I think it apparent that not all are to be regarded as young stages of the older species. The Mopaliidæ are never an *easy* group, but the difficulty of dealing with them

is increased by the fact that the young do not always closely resemble the adults, and the girdle characters, which seem to be of the highest importance in separating the species, are usually almost impossible to make out correctly in dried material. The members of the *sinuata-imporcata* group are at times particularly puzzling. Those having opportunities to collect them should not fail to see that any bearded chitons they may chance to find, however minute, are carefully fixed in the expanded state and preserved in alcohol. No attempt should be made to clean or dry them, lest valuable material lose much of its significance.

16. **Mopalia ciliata wosnessenskii** (Middendorff)

Taken on shore at Forrester Island, at the Waterfall Cannery, Prince of Wales Island, and inside Cape Lookout, Dall Island.

The specimens are quite variable, some very elevated for this subspecies, some depressed, and running through a whole gamut of color forms. A few of the dried specimens from Forrester Island are unusually long and narrow.

17. **Mopalia hindsii** (Reeve)

Seven specimens were taken at low tide on Forrester Island. All are of exceptional size, one in Mr. Willett's collection [S. S. B. 308] measuring in the dry condition as follows:

Maximum length of animal	90	mm.
Maximum width of animal	45.5	mm.
Length of shell alone (not exact)	86	mm.
Width of fourth valve inside girdle	36	mm.

18. **Mopalia lignosa** (Gould)

This is apparently a rare species in this region, as Mr. Willett took but one specimen at Forrester Island in 1914, none in 1915, and again one in 1916. Two were found near Cape Lookout, Dall Island in 1915. All the specimens were taken on shore.

19. **Mopalia muscosa** (Gould)

This species would appear to be excessively rare, only a single specimen having been taken inside Cape Lookout, Dall Island, and none at all at the other localities. The specimen is not a very large one, but seems typical.

20. **Mopalia imporcata** Carpenter

Dredged in 15-25 fathoms at Forrester Island, and apparently *the* common *Mopalia* in all the shallower depths. The specimens are very uniform in size and general appearance, but exhibit some variation in the minor details of sculpture.

21. **Mopalia sinuata** Carpenter

A few specimens were taken with the last species in 15-20 fathoms at Forrester Island, but not very frequently.

22. **Placiphorella velata** Carpenter

In Mr. Willett's experience this is another of the notably rare chitons. Only two specimens were taken, both at low tide on Forrester Island in 1915.

23. **Placiphorella rufa,** new species

More common than *P. velata* at Forrester Island, though always dredged, is the very interesting *Placiphorella* now to be described.

Diagnosis: Shell of moderate size, broadly oval in outline, depressed. Dorsal ridge only moderately elevated, the side slopes little convex.

Anterior valve crescentic, showing strong, irregular lines of growth and occasional weak traces of radial grooves. Median valves with the lateral areas raised into diagonal and sutural ribs having a groove-like depression between; otherwise unsculptured except for the strong, uneven lines of growth, especially prominent where they traverse the ribs; not beaked. Posterior valve small, only about half as wide as the anterior valve; sculptured by two strong, oblique ribs converging to the depressed, distinctly posterior, but not marginal, mucro.

Interior of valves calloused. Anterior valve with 9 strong, distinctly cut insertion teeth, the 3 anterior concave, and all coarsely grooved on their outer surfaces; slits 8 in number, their porous apices connected with the apex of the valve by lines of minute pores. Central valves with wide, gently arcuate sutural laminæ, scarcely if at all connected across the rather deep sinus; slits 1-1. Posterior valve with a barely indented flattening instead of a posterior sinus; slits 1-1. Eaves distinctly spongy.

Girdle of moderate width posteriorly, broadening in front to the wide lobe characteristic of the genus, so that the maximum diameter of the animal is in the region of the head (text figs. 3-4). To the naked eye or under lenses of moderate power the girdle appears smooth and nude over its entire area dorsally[1] save for a marginal palisade of minute hyaline spinelets, and three or four submarginal series of armored chætæ, the members of the inner series of which are conspicuously the largest and extend clear around the girdle, about 12 chætæ in this series encircling the anterior lobe, the remainder placed 1 opposite each suture and 2 directly behind the tail valve. The ventral surface of the girdle is clothed with very minute scattered spinelets, visible only under quite a high power. In dried specimens the girdle becomes excessively thin and leathery. The ventral surface of the anterior lobe shows no evident radial striation even under moderate magnification.

Color of shell in alcohol, a warm brownish red with more or less lighter painting, except the anterior portion of the head valve which is uniformly paler. Girdle brownish buff, the anterior lobe sharply paler. Interior of shell tinted a soft salmon flesh.

Precephalic lobe of mantle with 7 large digitations and a number of smaller ones.

Ctenidia 21-22 on each side.

Measurements of type (in alcohol):

Maximum length of animal	32.7	mm.
Maximum width of animal	26	mm.
Length of anterior lobe (dorsal)	8	mm.
Length of shell alone	22.5	mm.
Width of fourth valve inside girdle	16	mm.

[1]That it is actually thus devoid of spines I am not prepared to state.

Type: A specimen in alcohol [S. S. B. 240] entered as Cat. No. 1411 of the author's collection. Paratypes have been deposited in the collection of the California Academy of Sciences and the private collection of Mr. George Willett.

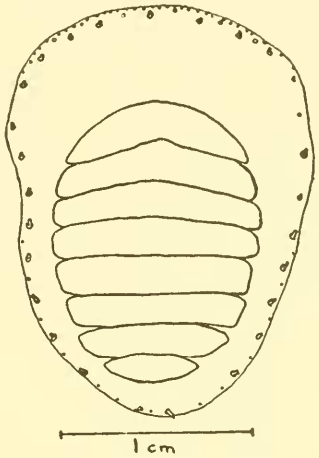

Fig. 3. *Placiphorella rufa* Berry, camera outline of dorsal aspect of type specimen, x2½.

Type Locality: 15-25 fathoms, Forrester Island, Alaska; George Willett, July, 1914-1916; 15 specimens.

Remarks: The fine series of specimens obtained by Mr. Willett shows that *P. rufa* is a very distinct species, standing quite

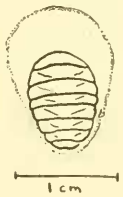

Fig. 4. *Placiphorella rufa* Berry, camera outline of dorsal aspect of a juvenal from Forrester Island, Alaska [S. S. B. 242a], x1½.

alone with respect to certain of its characters, but on the whole undoubtedly nearest to the members of the *P. velata* group of the genus. From *P. velata* and its analogue *P. stimpsoni*, our form is readily distinguishable by its warm, ruddy external

coloration, warm flesh and salmon tinting of the interior of the shell, pale anterior lobe, nearly nude girdle, and the marginal position of the setæ. Further characters to be noted only on dissection are the spongy eaves, curious rows of pores in the anterior valve, open sinuses, and sharply cut teeth. This combination of features should effectually prevent the confusion of *P. rufa* with any of the described forms. It is an important addition to our fauna.

24. **Katharina tunicata** (Wood)

The specimens seen by me were taken between tides at Sitka and at Forrester Island, but Mr. Willett writes: "Have found *Katharina* and *Cryptochiton* common everywhere I have been in S. E. Alaska, both in smooth water and rough."

25. **Cryptochiton stelleri** Middendorff

Here again the specimens seen by me were taken between tides at Sitka and Forrester Island, but as just noted, Mr. Willett reports it an abundant species at every locality visited by him. The specimens seen run a good deal smaller than they do farther to the south, e. g., at Monterey.

Literature Cited

Balch, F. N.

:06. Remarks on certain New England chitons with description of a new variety. Nautilus, v. 20, pp. 62-68, October, 1906.

Sykes, E. R.

'94. Notes on the British chitons. Proceedings Malacological Society, London, v. 1, pp. 35-37, pl. 3, March, 1894.

Thiele, J.

:10. Revision des Systems der Chitonen, II. Teil. Zoologica, Bd. 22, pp. 71-132, pls. 7-10, Stuttgart, 1910.

2. On the Genus Trachydermon

In the preceding note I have briefly mentioned the species *Trachydermon flectens* Carpenter and indicated my belief that the genus should be interpreted in an altogether different way than has heretofore been recognized. This is entirely due to the fact, brought about quite incidentally by a strict adherence to the rules of the International Code of Zoological Nomenclature, that because of its subsequent selection for that rank by Pilsbry, *T. flectens* must be recognized as the type of Carpenter's genus. This exquisitely beautiful little chiton has been known for many years and is frequently met with in collections, yet, if I am correct in my identification of such specimens as I have seen with Carpenter's type, it has been one of our most misunderstood species. While its reference to the Mopaliidæ will no doubt occasion general surprise and will probably not be allowed to pass unquestioned, it seems to me clear that *T. flectens* has little in common with any of the numerous other species commonly ranked with it, and which latter I fear Carpenter himself really had most in mind at the time he founded his genus. It does not even belong in the subfamily to which in recent years it has given its name. Fortunately the recent rehabilitation of Gray's *Lepidochitona* by Iredale (:14, p. 127) has already precipitated the nomenclatorial changes which would otherwise have been the inevitable result of removing the type species of *Trachydermon* to another family.

The accumulation of evidence which has finally led me to the adoption of the course outlined had its beginning in the almost absolute parallel which is to be found between Pilsbry's description and figures of *T. flectens* in the concluding part of the "Manual" ('93, p. 64, pl. 15, figs. 34-37), and his later description of *Mopalia heathii* ('98, p. 288). By tabulating in parallel columns the essential items, not only of these two descriptions, but of Carpenter's own brief diagnosis (Pilsbry, '92, p. 75) and the present writer's more recent redescription of *heathii* (Berry, :11, p. 490, text figs. 4-7, pl. 40, figs. 1-3, 7), the strength of the evidence can be more readily appreciated and the reader then left to draw his own conclusions. Such discrepancies as then appear are thus thrown into relief for consideration later.

1. T. flectens Carpenter MS.	2. T. flectens Pilsbry, 1893	3. M. heathii Pilsbry, 1898	4. M. heathii Berry, 1911
Shell subelongate; jugum acute.	Shell ovate-oblong, moderately elevated.	Oblong, rather elevated, carinated, the side slopes nearly straight.	Oblong - elliptical, rather elevated, carinated, the side slopes nearly straight.
Surface with minute, not very close granules, sparsely subradiating.	Surface minutely granulate all over, more closely on the lateral areas, which are otherwise scarcely defined.	Surface finely and evenly granulate, the intervals very minutely radially wrinkle granulate. Anterior valve with a few faint shallow radial furrows.	Surface finely, evenly, rather distantly granulated.
Median valves with apices very prominent; lateral areas scarcely defined.	Median valves squared and slightly beaked.	Intermediate valves very faintly radially trisulcate at the sides, the anterior two grooves defining the low, slight and inconspicuous diagonal rib; lateral areas not raised.	Median valves wide and short, little beaked.
Mucro conspicuous, anterior.	Mucro somewhat anterior, rather projecting.	Posterior valve with semi-circular posterior outline; the mucro in front of the middle; profile of surface in front of it convex, behind it decidedly concave.	Posterior valve with semi-circular posterior outline; the mucro anterior; posterior slope concave.
Sinus wide, flat.	Sinus slightly laminate.	Sutural laminæ, sinus, and teeth about as in *M. lignosa*.	Insertion plates continuous across sinus.
		Posterior valve regularly ischnoid.	Posterior valve regularly crescentic.
Valve i with 11, ii-vii with 1-1, viii with 11 slits.	Valve i with 8, ii-vii with 1-1, viii with 7 slits.	Valve i with 8, ii-vii with 1-I, viii with 7-8 slits.	Valve i with 8, ii-vii with 1-1, viii with 5-8 slits.
Color roseate.	Color roseate or deep blood red, more or less maculated with blue, the blue predominating on some valves.	Color (1) olive green with lighter spots or rosy shading, or (2) vivid red with scattered blue spots.	Color vivid red with scattered blue spots and valves v-vii clouded with greenish.
	Interior of a beautiful deep rose color.	Interior deep rose color or slightly purplish.	
Girdle very minutely granulate.	Girdle rather densely covered with minute, elongated but scarcely imbricating scales.	Girdle nude except for 2 or 3 closely grouped long bristles at all or part of the sutures, 1 on each side of the head valve, and 2 behind the tail valve.	Girdle microscopically spiculose, bearing also a long branching bristle opposite each suture, 2-5 in front of the head valve, and 2 behind the tail valve, with a peripheral series of very small bristles around the girdle margin.
	Ctenidia extending 2/3 or ¾ the length of the foot.	Ctenidia about 25, not extending quite to the anterior end of the foot.	
Length 8¾, width 6 mm..	Length 12, width 7 mm.	Length 25, width 12 mm.	Length 11, width 7 mm.
Puget Sound, Wash.	Dredged off Victoria, B. C.	17 fms., Monterey Bay, Cal.	15 fms., Monterey Bay, Cal.
"A variety from Catalina Is. has the posterior valve with 7, intermediate 1, anterior 8 slits, the mucro less anterior." (Carpenter).			

Considered in connection with the figures given by Pilsbry ('93, pl. 15, figs. 34-37) and myself (:11, pl. 40, figs. 1-3, 7), the table appears to me conclusive that the specimens identified by me in 1911 as *Mopalia heathii* (column 4 above) are certainly congeneric if not specifically identical with *Trachydermon flectens* Carpenter, as interpreted by Pilsbry (column 2). Down even to such details as size, color, and station the parallel is an instructive and telling one. But in view of the admitted source of possible error due to my having access to neither of the type specimens concerned, it would be folly to overlook the difficulties offered by the various discrepancies in columns 1 and 3. As to column 1, the only trouble lies in the large number of slits quoted for the head and tail valves and the description of the girdle. The former may or may not be an essential matter, depending on whether the number printed be a *lapsus* (which I do not believe), or may indicate an abnormal specimen, or may (which appeals to me as the most probable) come within the limits of normal variation, already noted as considerable in the Monterey specimens described in column 4. The discrepancy in the description of the girdle in column 1 as compared with column 4 is also shared by column 2. This appears at first sight the most serious of all, but I think is very easily accounted for by the very delicate and brittle consistency of the bristles, which I find to be almost invariably broken off in dried specimens in such a way as frequently not to leave the slightest trace of their previous existence. This is brought out very clearly in the series of specimens taken at Forrester Island by Willett, all of which were preserved dry, but which reached me soon enough afterward so that I was able to make out the character of the bristles. In most of these the bristles, however, appear either as mere stubs or so nearly indistinguishable that in the absence of some suspicion of their presence they might never be detected. It is only in living or alcoholic material that the full characters of this species are evident.[2]

[2] It is worth while noting that specimens from the original lot of "*Trachydermon flectens montereyensis* Bartsch", a *nomen nudum* which has appeared several times in print, are in every respect completely identical with the specimens referred to by me as *M. heathii* in column 4 above. From similar evidence there is no doubt that "*Chætopleura rosetta* Bartsch", another *nomen nudum* which has found its way into the literature, falls into the absolute synonymy of *Dendrochiton thamnoporo*. I can as yet discover no evident connection of this species with the genus *Chætopleura*.

Let us now pass to column 3. Pilsbry, who is a careful observer, states that beyond the bristles the girdle is *nude*. This statement and the unusual size of his type specimen do not fit in well with the remainder of the table, though the weight of all the rest of the evidence would indicate that *Mopalia heathii* Pilsbry must fall as a synonym of *T. flectens*. Can it be barely possible that there are *two* species involved in the original description of *M. heathii?* This, with other correlative points, will receive attention in a later communication.

From evidence before me, my present inclination is to give both *Trachydermon* Carpenter, as redefined (type: *T. flectens* Carpenter), and *Dendrochiton* Berry, 1911 (type: *Mopalia (D.) thamnopora* Berry) full generic rank, referring both, though only tentatively, to the family Mopaliidæ.

Literature Cited

Berry, S. S.

:11. A new Californian chiton. Proceedings Academy of Natural Sciences of Philadelphia, 1911, pp. 487-492, text figs. 1-7, pl. 40, October, 1911.

Iredale, Tom.

:14. Some more notes on Polyplacophora. Part I. Proceedings Malacological Society, London, v. 11, pp. 123-131, June, 1914.

Pilsbry, H. A.

'92. Monograph of the Polyplacophora. (Lepidopleuridæ, Ischnochitonidæ, Chitonidæ, Mopaliidæ). Manual of Conchology, v. 14, pp. i-xxxiv, 1-350, pl. 1-68, Philadelphia, 1892.

'93. Monograph of the Polyplacophora. (Acanthochitidæ, Cryptoplacidæ, and Appendix.) Manual of Conchology, v. 15, pp. 1-132, pls. 1-17, Philadelphia, 1893.

'98. Chitons collected by Dr. Harold Heath at Pacific Grove, near Monterey, California. Proceedings Academy of Natural Sciences of Philadelphia, 1898, pp. 287-291.